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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/084,389

02/25/2002

Stephen M. Dershem

QUANT1190-3
(028248-1010)

8561

30542 7590 06/27/2003

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EXAMINER

MCCLENDON, SANZA L

ART UNIT

PAPER NUMBER

1711

8

DATE MAILED: 06/27/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/084,389

Applicant(s)

DERSHEM ET AL.

Examiner

Sanza L McClendon

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 01 August 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 46-57 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 48, 51, 55 and 57 is/are allowed.
- 6) ☒ Claim(s) 46, 47, 49, 50, 52-54 and 56 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
 If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 a) ☐ All b) ☐ Some * c) ☐ None of:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
 * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
 a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____. 6) ☐ Other:

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DETAILED ACTION

Response to Amendment

1. In response to the Amendments received on August 1, 2002 and February 25, 2002, the examiner has carefully considered the amendments. The examiner acknowledges the cancellation of claims 1-45.

2.

Claim Rejections - 35 USC § 102/35 USC § 103

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless -

(d) the invention was first patented or caused to be patented, or was the subject of an inventor's certificate, by the applicant or his legal representatives or assigns in a foreign country prior to the date of the application for patent in this country on an application for patent or inventor's certificate filed more than twelve months before the filing of the application in the United States.

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 46-47 and 52 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Drain et al (4,886,842).

Drain et al teaches photopolymerizable epoxy-amine compositions employing the use of unsaturated imides for preparing adhesive compositions for electronic components. Said

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imides are selected from the group of formulas listed in column 2, lines 55 to the end to column 3, lines 1-10, wherein R or R' are monovalent or divalent organic groups having 200 or fewer carbon atoms, preferably a C2 to C20 hydrocarbon group. Drain et al teaches that said composition further comprises a photoinitiator—see column 5, lines 53-57. Said preferred photoinitiator is a combination of a hydroperoxide and metal complex—see column 6, lines 62-64.

Drain et al teaches in column 5 bismaleimides such as ethylenedimaleimide, hexamethylene dimaleimide, decamethylene dimaleimide, dodecamethylene dimaleimide, wherein these are deemed to anticipate claim 47. Because the above listed bismaleimides are in a laundry list of other useable maleimide derivatives, the examiner deems that it would have been obvious for a skilled artisan to selected an aliphatic bismaleimide compound as taught by Drain et al to prepare said epoxy amine compositions, wherein the motivation would have been the expectation of adequate success in preparing an adhesive composition that exhibits excellent adhesion to plastic substrates in electronic/electrical components, as suggested by Drain et al—see column 1, lines 10-20.

Drain et al teaches the use of dodecamethylene bismaleimide in said adhesive compositions; this appears to anticipate claim 52. However, it would have been obvious for a skilled artisan to select said bismaleimide. The motivation would have been the expectation of adequate adhesion and thermal stress resistance when bonding electronic components as taught by Drain et al—see column 1, lines 15-20.

Per example 2, Drain et al teaches curing said compositions in fewer than 5 seconds using irradiation, wherein it is assumed by the examiner to be cured at room temperature because it is not disclosed by the teachings of Drain et al. Since applicant does not specify in claim 47 the type of curing in said composition, i.e. total cure, partial cure, gelling, substantial cure, and the like, the teaching of the irradiation curing in Drain et al appears to anticipate 47. Because Drain et al teaches that said compositions are useable as adhesive for electronic components, the composition appears to anticipate claim 46.

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

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A person shall be entitled to a patent unless -

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. Claims 52 is rejected under 35 U.S.C. 102(b) as being anticipated by Dershem et al (5,447,988).

Dershem et al teaches solvent-less die-attach compositions. Said compositions comprise liquid polycyanate ester monomers, electronically conductive fillers, and curing catalyst. In addition, said composition can comprise chelating agents for the fillers and other monomers. Said other monomers are useful to provide a monomer vehicle that is liquid at ambient temperatures. Said other monomers can comprise aliphatic bismaleimides. Dershem et al teaches mixing a cyanate ester with at least a 12% of 2,2,4-trimethylhexamethylene-1, 6-bismaleimide which remains liquid for an indefinite amount of time. Per examples Dershem et al teaches attaching 500 mil² silicon dices to alumina substrates and curing. These teachings appear to anticipate claim 52.

8. Claims 49 and 50 are rejected under 35 U.S.C. 102(b) as being anticipated by Martin et al (4,564,663).

Martin et al teaches free radical curing of bismaleimides of dimer diamines. Said curing is accomplished using hydroperoxides promoted with vanadium trineodecanoate and N, N'-dimethyl-p-touidine. Said bismaleimides are aliphatic and liquid bismaleimides—see column 1, lines 39-44 and column 2, line 18. This appears to anticipate claim 49. Martin et al teaches said free radical curing method can be accomplished without the need to use solvents—column 1, lines 54-56. This anticipates claim 50.

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the

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subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. Claims 49-50, 53-54, and 56 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ketley (4,740,830) in view of Martin et al (4,564,663).

Ketley teaches low temperature single step curing polyimide adhesives for electronic devices, such as semi-conductors. Said adhesives comprises 15-50% of a bismaleimide resin having the formula found in column 1, line 55, wherein R is an aromatic group; 15 to 30 wt% of a solvent; and 50-85 wt% of silver powder. Wherein silver is electrically conductive, as well as, thermally conductive. Ketley teaches said silver-paste adhesive can be used for bonding electronic devices, such as semiconductors, to substrates. Said method of bonding comprises applying said paste onto a substrate, setting said electronic device onto the paste coated substrate, applying pressure to form an assembly, and then curing said assembly—see column 4, lines 30-35. Ketley does not expressly teach a bismaleimide resins comprising polyvalent radical groups having sufficient length to render the maleimide compound a liquid and adding a peroxide-curing agent.

Martin et al teaches free radical curing of liquid, aliphatic bismaleimides of liquid dimer amines. Said curing is accomplished using hydroperoxides promoted with vanadium trineodecanoate and N, N' -dimethyl-p-touidine. Martin et al teaches aliphatic substituted bismaleimides have superior properties to aromatic substituted bismaleimides, such as lower temperature curing and eliminates the need for solvents to facilitate processing to provide for adequate structural integrity of the cured products comprising said aliphatic bismaleimides.

Ketley and Martin et al are analogous art because they are from the same field of endeavor that is the art of thermally curable bismaleimide compositions.

Therefore it would have been obvious for a skilled artisan to use a liquid aliphatic bismaleimide compound in the adhesive compositions, as taught by Ketley. The motivation would have been to produce a solventless die-attach adhesive composition with easy processing steps, i.e., mixing and/or blending steps without the need for solvents and/or heat to a homogenously composition, which has strong structural integrity (Martin et al: column 1,

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lines 39-49) without the possible production of toxic by-products to contaminate the products produced (Ketley: column 3, lines 60 to end) with the expectation of adequate success in the absence of unexpected results or arguments to the contrary.

Allowable Subject Matter

11. Claims 48, 51, 55, and 57 are allowed.

12. The following is an examiner's statement of reasons for allowance: The prior art fail to teach a maleimide composition comprising a maleimide containing curable component which when dispensed between a 300 mil² silica die with an Ag coated lead frame as a 1 mil bondline and cured for 1 minute at a temperature of about 200 °C, demonstrates an initial adhesion value of at least 115 lbs and a post pressure cooker adhesion of less than 83 lbs. Although the prior art teaches using maleimide containing adhesives to bond different size silica dices with Ag coated frames having similar range adhesion values, the prior art fails to teach any such adhesive compositions that provide said adhesion values after curing for 1 minute at a temperature of about 200 °C, said prior art temperatures and times are much higher, such as temperatures of greater than 240 °C and times from 5 minutes to several hours. The prior art fails to teach a resin composition comprising a liquid maleimide having the formula found in claim 51 with the corresponding definitions and a peroxide initiator, wherein said composition additionally comprises a filler.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sanza L McClendon whose telephone number is (703) 305-0505. The examiner can normally be reached on Monday through Friday 8:00 to 4:30.

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, James Seidleck can be reached on (703) 308-2462. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0657.

Sanza L McClendon

Examiner

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SMc

June 23, 2003



James J. Seidleck
Supervisory Patent Examiner
Technology Center 1700